

USING VFD AND SCADA PLC BASED BOTTLE FILLING AUTOMATION

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Abstract - In the recent years, every individual rely on best quality products and this has increased the industries to automate their machineries. There is a high demand from the consumer side to get a good quantity of products in a very less time of production. In order to fulfil these demands strong technologies are needed which have lead to the birth of automation. Keeping this in mind, a motorized filling of liquid bottles in industries is worked out in this particular paper. This entire system will be utilising a Programmable Logic Controller which will be helpful to control the industrial systems. A hardware named VFD, is used to control the frequency of the squirrel cage induction motor. A software tool named SCADA (Supervisory Control & Data Acquisition) will be helpful in order to view the complete process without being present onsite. To sum it up, whenever there is any problem in the industrial site, this tool helps us monitor the problem, debug the problem and hence operate conveniently on the problem.

Key Words: Onsite, motorized, automate, VFD, Variable Frequency Drive, squirrel cage induction motor.

1. INTRODUCTION

The beverage industry can reach to a great extent only those which uses very effective technology . Different challenges are faced by many industries. There is too much of pressure to produce high quality and quantity products, hence the existing system gets into too much of maintainance problems and productivity issues. The managers are under pressure as they have to produce more products in less cost and time. Hence new technology is needed in which the cost is less, time is less, water wasted is less, energy produced will be increased. The effective approach to this issue is a process which integrated. If all the process have been made to work together, good communication is build up among all factory machines, huge challenges can be met very efficiently. There are many small scale industries where this refilling is not operated through machines, thus too much time is consumed hence the industry faces huge loss. In most of the places micro-controllers, being cheaper is used in a huge quantity in various industries but nowadays, the people are also using plc based systems, hence this paper deals with the use of such technology commercially. To hike the improvement of this entity, SCADA is used to operate and access the on going onsite process through various computerizations. This is helpful for women entrepreneurs who dream to work on such automation plants but due to the problem of being present on site all the time, it becomes tedious. Hence with SCADA they can work out the entire process at their own convenience.

1.1 PROBLEM STATEMENT

In older systems a machine called cyclo-converter were used which would provide very low accuracy as speed could be set only for a predefined time and could not be altered before the set time elapsed. To sort this problem, Variable Frequency Drives are used which can help us to alter the frequency and speed according to the industrial and consumer needs.

2. DESIGNING

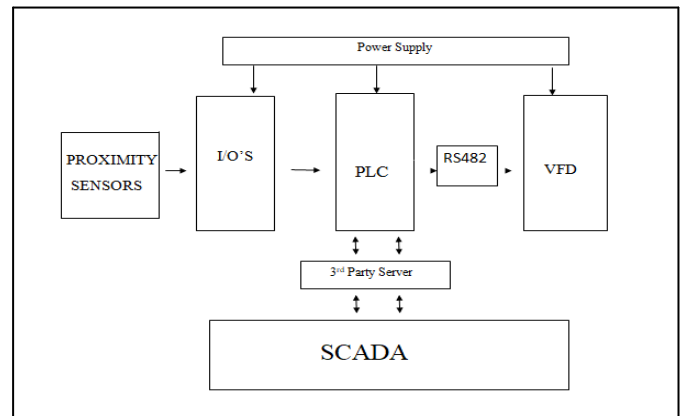


Fig- 1. : Proposed Block

The picture that is demonstrated above is the representation of the process which is done with help of hardwares & softwares. There will be a section that is used for filling, another section used for sealing the bottles and when these two activities are over, the bottles will be directed out through the conveyor. A sensor named as a proximity sensor will be helpful for detecting the bottle's presence. The inputs are the bottles that are getting inside through the belt. The power supply is Switched mode, which operates on 24v dc supply and is chosen over linear supplies because of its higher working efficiency. The PLC and VFD are connected through the RS485 serial communication and its also a 2-wire communication. The serial communication establishment is done by using MODBUS ASCII, which is a protocol for communication. The Modbus will be connecting a supervising PC to Remote Terminal Unit in Supervisory Control & Data Acquisition entities. Serial communication is used since each process like filling, capping and sealing takes place one at a time to avoid congestion in the outlet. To generate a good connection between the SCADA & PLC another communication called RS232 is set-up. The SCADA reads all the information from the system and then redirects

the PLC to work for the same. These two are connected by the help of a third party server that will pass on all the information from one site to the other. The SCADA software that is used is Intouch V10.0. The third party server that is used is Kepsrver V5. Software needed to program the PLC is Wplsoft V2.4.

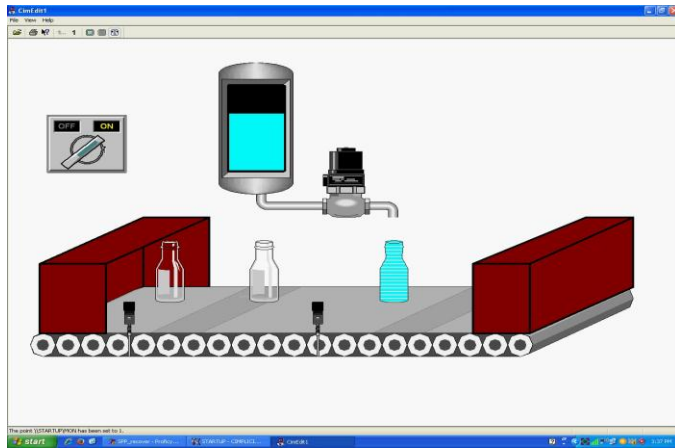


Fig- 2. : SCADA screen showing filling of bottles

2.1 REQUIRED COMPONENTS

A. PLC

For controlling the processes that is regularly occurring in the industries that manufacture substances/ articles/ products programming controllers popularly called as the PLC's have been chosen. It is such a device which we can program it in numerous methods. The most in-trend language is the ladder-logic method which will only use relays and switches to write the entire lengthy code. The other common/popularly written codes are C language codes or BASIC. Reason to use PLC: as its quick, leads to the consumption of the power to be extremely less, finding the fault and diagonis of those faults become very simple and numerous others. It additionally regularly is utilized as a part of our day-to-day applications or appliances like, in clothes washers and also for controlling the movement signs and lifts. They are also utilized as a part of screen to business and procedures that includes creation control and buldings that are requiring frameworks.



Fig. 3. : PLC used in our work

B. VFD

A Vfd which is also coined as a adjustable frequency/speed driver is helpful to every-body as it provides the facility in controlling the turn and speeds of the various AC motors by recasting the frequency and vtg which is given as a input. Its profit lies in the fact that it will vary the freq/speeds without even harming the consumption of the electricity or turns. The VFD specs that we have used are included below:

- Model No. - VFD 004M21A
- I/P - Single (1) phase
- O/P - Three (3) phase
- The vtg at which it is operating - 230V
- Power Rating used - 0.5HP



Fig- 4. : A Vfd

C. PROXIMITY SENSORS

A sensor named as proximity is so useful and better if we start comparing to all other sensors that are existing and the only reason for it is that we can actually make an object sense by it by placing the object near the sensor. We do not have to actually make directly a touching or contact action with the above mentioned device. The great concept of this is that it will decrease the show control by killing the illumination backdrop of the LCD & the touch-screen cripples a distance which is strategic from touches that occur due to coincidence.



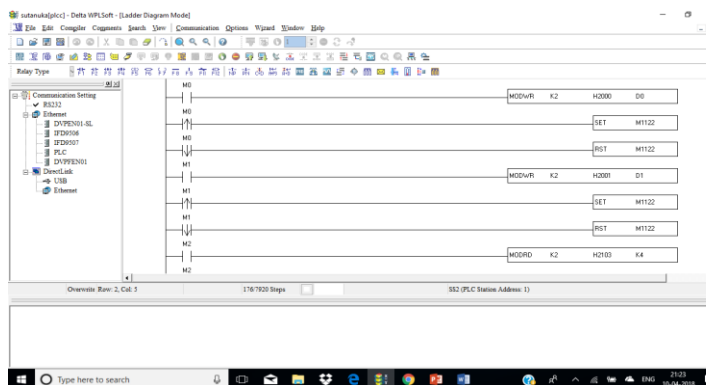
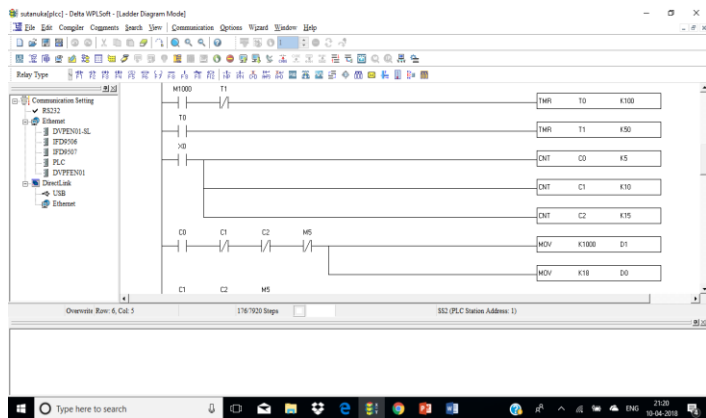
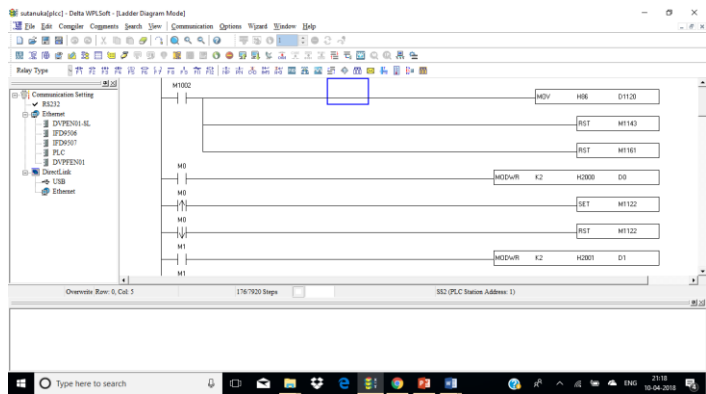
Fig- 5. : A Proximity Sensor

D. SCADA

This has brought a wonderful revolution in the field where automation has a major role to play. This is because a whole set of working can be operated by not even being standing and watching the process running in the industrial environment. Citing an example to this, an Industrial firm is located in Bengaluru faces some serious issue/problem at the plant where manufacturing is taking place could be very easily sorted by an engineer or manager in charge whose office is located in the city which is the capital of India i.e., New-Delhi.

E. LADDER LOGIC FOR PLC

All procedures of the discussed system is depicted in the steps below by ladder-logics of PLC.



3. CONCLUSION

As mentioned previously the growth of the industrial era has become a huge concern for every person in this world as every-body is directly or indirectly associated to industrial area. So, this is a paper that demonstrated a filling of a bottle technology by itself using a concept of Automation. By using the different components & software mentioned in the designing field the proper outcomes are examined. The entire process that has been discussed in our paper is discussed in mind in general the industrial liquid. To be specific about the industries this method can be used in soft-drinks, milk, water, beer, paint or any packaging industries where managing and deviation are implemented in regular basis.

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